SURFACTANT WATER MODIFIED SILICA NANOPARTICLE MOLECULAR INTERACTION

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ABSTRACT

The involvement of Nano Technology and silica in the foam formation plays an important role to enhance the oil recovery. However, its molecular dynamic interface abilities and interactions behavior were not widely known. The challenge in the foam flooding was foam created was easy to break. It was difficult to maintain the stability of foam created when comes in contact in the reservoir due to the lower of viscosity effect. Thus, the molecular interactions behaviors and understanding the structural and dynamic information of the absorption of Alpha Olefin Sulfonate (AOS) on the interface of water and air was conducted using molecular dynamic simulations in Material Studio 7. The modification of silica nanoparticles (SNP) demonstrated by attachment of Hexyl-trimethoxysilane (HTMS) on SNP surface. From the simulation, the data such as Mean Square Displacement (MSD) and Cohesive Energy Density (CED) were extracted as measurement to investigate the diffusivity and water-air surface tension, respectively. The diffusivity of AOS in the system that using modified SNP was higher than SNP without HTMS which was 0.3099 \dot{A}^2 /ps and 0.2891 \dot{A}^2 /ps, respectively. In addition, the surface tension for the system with HTMS was lower than surface tension for SNP without HTMS which was 1.80×10^{10} GPa and 2.39×10^{10} GPa, respectively after 100 ps. These result indicated that the modified SNP with HTMS improved the adsorption of the surfactant. Thus, the foam stability was slightly higher with the presence of HTMS on SNP surface.

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CHAPTER 1

INTRODUCTION

1.1 Background study

Nowadays, human activity is mostly use petroleum as the main source to produce energy by combustion. Therefore it contributes to the increase in the demand for the petroleum. Thus, many ways were taken to get oil from underground reservoir. In petroleum industry, the vital approach to get oil and gas is by using drilling method which was utilized to make holes in the earth subsurface. This method was done using a special machine known as drilling rig. The term rig refers to the complex part that is utilized to infiltrate. The lower part of drilling rig is comprised of three sections. Three section are bottom hole assembly (BHA), transition pipe and drill pipe (Albdiry & Almensory, 2016).

For the first section, which is bottom hole assembly (BHA) function as stone breaking tool and drill bit. The BHA is substantial with a thick walled empty tube utilized for drilling fluid. The drilling fluid will be pumped down through it. The second section is, transition pipe. Its function was to provide adaptable move between drill collars and drill pipe. The third section is drill pipe. Every drill pipe involves a long tubular diameter portions (Albdiry & Almensory, 2016). However, there is still oil that not being completely sucked. Thus, the recovery of the trapped oil is needed. There are three available phase in oil recovery.

Firstly, the primary oil recovery is defined as the amount of the reserve recovered by primary production. Normally primary oil recovery was done without injected fluid pressure support. Primary oil recovery was done by the help of gravitational force and the use of natural pressure. In petroleum industry, the drilling was done to collect oil at underground. In primary oil recovery, the gravitational